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ABSTRACT

Reported is an experiment undertaken to determine the extent to which analytic and global cognitive styles differed in developing or utilizing a selection type strategy in concept identification. Using the Hidden Figures Test (HFT) in five sections of an introductory psychology class, two groups of students, one analytical and one global, were chosen to participate. Each group contained 10 male and 10 female students. After specific instructions, students were asked to solve several concept identification problems. A 2 x 2 x 8 repeated measure analysis of variance was performed with the variables of sex, cognitive style and blocks of study. Analyses were performed on the trials to solution, focusing strategy scores, and duplicate hypotheses. Results showed the effect of cognitive style was significant at the .01 level, favoring analytic style. Analyses of the effect of blocks was significant at the .01 level. There was a greater tendency for the analytic group to use a focusing strategy. Analysis of the mean number of duplicate hypotheses indicated that the cognitive style was significant at the .01 level. Analytic students had a mean of .10, the global students mean was .19. (Author/EB)

STRATEGY DEVELOPMENT AND UTILIZATION IN CONCEPT IDENTIFICATION AS A FUNCTION OF AN INDIVIDUAL'S COGNITIVE STYLE[1]

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Using a reception paradigm, Davis and Klausmeier (1970) found that Ss with an analytic cognitive style were more efficient in solving concept problems than were Ss with a global cognitive style. One possible explanation of the less efficient behavior of global Ss is that they are not as efficient in developing or utilizing a strategy which is appropriate to their learning task. Therefore the purpose of this experiment was to determine the extent to which analytic and global Ss differed in developing or utilizing a selection type strategy.

METHOD

Subjects. The Hidden Figures Test (HFT) was administered to five sections of introductory educational psychology classes and involved testing 194 Ss. Since previous research using the HFT had reported sex differences, separate distributions of the HFT scores were made for males and females. Ten analytic females and 10 analytic males were randomly selected from the pool of Ss who scored onestandard deviation above the mean. Ten global

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females and 10 global males were randomly selected from the pool of Ss who scored one standard deviation below the mean. Each of the 40 Ss were tested individually and were paid an hourly rate for their eight testing sessions.

Stimulus Materials. Stimulus cards were prepared by combining two levels of each of seven bi-valued dimensions on 7.5 cm. by 7.5 cm. cards. The dimensions and their corresponding values were: letter (A or E), number of letters (1 or 2), size of letters (large or small), color of letters (red or blue), orientation of letter (upright or tilted), horizontal position of letters (left or right), and vertical position of letters (top or bottom). The display of the stimulus cards was composed of 128 different cards and the cards were mounted on a large stimulus-display board in an ordered array with 8 rows and 16 columns.

Procedures. Upon entering the laboratory, each S was told that he would be asked to solve several concept identification problems. A standard set of instructions was given to each S. In general, the instructions described the seven stimulus dimensions and illustrated how the cards were arranged on the stimulus-display board. Each S was instructed that all problems would be conjunctive with two relevant dimensions. Furthermore, each S was told that each problem would begin with a focus card which contained the two relevant dimensions he was searching for. He was further told that after the focus card was designated, he could select any instance he wanted information

about by calling out its identification number. The E would then respond by saying "yes" if the instance selected was a positive instance of the concept or respond by saying "no" if the instance was a negative instance. He was further instructed that after he had received feedback from the E he could offer a hypotheses concerning the solution to the problem. If the hypothesis was correct, the problem was terminated and if the hypothesis was incorrect, he was told "no" and was asked to continue choosing another card. Thus only one hypothesis could be offered per card choice. The S was told that his task was to identify the concept as efficiently as possible.

Following the instructions, S were given a series of tasks to insure tat they understood the instructions. First, all Ss were asked to name the seven values of certain stimulus cards. Second, Ss were given sample concepts and asked to give four cards which illustrated the concepts. Next, the Ss were asked to give feedback (respond by saying "yes" or "no") for certain cards which were positive or negative instances of two concepts. Each S solved 10 problems per day for eight days for a total of 80 problems. Within the confines of the stimulus population, there were 84 unique two-valued conjunctive concepts. From this pool of 84 concepts, 80 were randomly selected for each of the 40 Ss.

RESULTS

A 2 x 2 x 8 repeated measure analysis of variance was performed with the variables of sex (male or female), cognitive style (analytic or global) and blocks (eight blocks of 10 problems each). A conservative test (Box, 1954) was employed in analyzing the main effect of blocks and all of the interactions involving the block factor. An analysis was performed on each of three major dependent variables: trials to solution, focusing strategy scores, and duplicate hypotheses.

Trials to Solution. The dependent variable of mean number of trials to solution consisted of treating each card choice and hypothesis associated with the card choice (if offered) as a trial. The effect of cognitive style was significant at the .01 level, $F(1,36) = 11.20$. Analytic Ss solved the concept learning problems in fewer trials than the global Ss. Analytic Ss required an average of 5.71 trials to solution while the global Ss required an average of 8.03.

Analysis of the effect of blocks of 10 problems was found to be significant at the .01 level, $F(1,40) = 212.04$. In general this finding merely reflected an improvement in performance across the eight blocks. The interaction involving blocks by cognitive style was found to be significant at the .01 level using the conservative test, $F(1,20) = 27.32$. Also, the three-way interaction involving blocks, sex and cognitive style was found to be significant $F(1,12) = 221.68$; $p < .01$).

Focusing Strategy. In order to arrive at a quantified measure of strategies, a procedure developed by Laughlin (1966) was employed. This procedure involved calculating a ratio of the number of trials in which only one stimulus dimensions was varied to the total number of trials. This ratio provided a conservative focusing score which ranged in value from .00 to 1.00. A score of .00 would indicate an absence of focusing, while a score of 1.00 would indicate a perfect focusing score.

For each S the focusing score was obtained for each problem and then averaged for each block of 10 problems. The main effect of cognitive style was significant at the .01 level, $F(1,36) = 12.44$. Analytic Ss had a mean focusing score of .86 and the global Ss had a mean focusing score of .73. Thus there was a greater tendency for the analytic Ss to use a focusing strategy. A significant ($p < .01$) effect of blocks was also obtained, using the conservative test, $F(1,40) = 37.64$. Overall this finding reflected a progressive improvement in the focusing score. The means for blocks one through eight were: .58, .72, .77, .81, .86, .84, .89, and .90, respectively.

Duplicate Hypotheses. Analysis of the mean number of duplicate hypotheses indicated that cognitive style was significant at the .01 level, $F(1,36) = 16.88$. Analytic Ss had a mean of .10 duplicate hypotheses and global Ss had a mean of .19. The main effect of blocks was also significant, $F(1,40) = 27.20$, $p < .01$. Subsequent analysis by means of the Newman-Keuls procedure indicated that the mean of the

frist block was significantly ($p < .01$) different from the means of blocks two through eight. Also, the mean of block two differed significantly from the means of blocks four through eight. None of the other comparisons was significant.

Summary and Conclusions

A particular feature of this experiment was that Ss were asked to solve 80 relatively simple conjunctive problems. A large number of problems was included since it was assumed that Ss, in part, learn a particular strategy within the context of the experiences of the actual learning situation, and therefore do not begin the learning task with a fully developed strategy. Instead a strategy gradually evolved as Ss acquired more and more experience with each successive problem. This assumption was strongly supported in the present experiment and is illustrated by the significant effects of blocks for each of the dependent variables. The results of the present experiment do provide evidence that Ss do demonstrate strong interproblem transfer. Performance on the last block of 10 problems was nearly perfect for two-valued conjunctive concepts. Examination of individual Ss protocals also reveals that Ss became very consistent in terms of the sequences in which they would vary specific dimensions. For the last 10 problems, for example, a S would follow the sequence of first varying the horizontal position of letters, then the dimension of vertical position of the letters, next the orientation of the letters, followed by

number, size, color, and finally letter. Although there was some variance between Ss in terms of the sequence in which specific dimensions were vaied, each of the 40 Ss was quite consistent within their last 10 problems.

Another purpose of the present experiment was to determine the extent to which analytic and global Ss differed in developingor utilizing a selection type strategy. In general, the performance of analytic Ss was found to be more efficient than the performance of global Ss. Overall, analytic Ss solved the concept learning problems in fewer trials, fewer duplicate hypotheses, and had a higher mean focusing score than did global Ss.

The processes or factors contributing to the general inefficiency of global Ss is not entirely clear. There is some evidence, however, which suggests that the relatively poor performance of the global Ss is in part due to a less efficient memory. This evidence was found in terms of a significant effect of cognitive style for duplicate hypotheses and a significant effect of duplicate card choices. An analysis of variance was performed on mean number of duplicate card choices and reflected a significant effect of cognitive style, $F(1,36) = 4.81$, $p < .05$. Analytic Ss had an over-all mean number of duplicate card choices of .26 and global Ss had a mean of .58. These findings suggest tnat global Ss were less able to remember the previous cards they had chosen and also less

able to remember previous hypotheses they had offered. An alternative interpretation of these findings is also possible. It might be that the higher incidence of duplicate card choices and hypotheses reflects a tendency on the part of global Ss to reject the feedback of E once they have erroneously arrived at a solution. Given that a global S has arrived at a solution which he feels is warranted by the information he has, he may still cling to that solution and simply go through the same sequence of card choices or hypotheses to verify to himself that his solution is consistent with the information he has processed. Additional research is needed to clarify which interpretation best accounts for the data.

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